

T H E S I S.

A PLEA FOR AN OBJECTIVE PSYCHIATRY.

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A Plea for an Objective Psychiatry.

The thing which most impressed me in the early days of my assistantship in a large mental hospital and which has continued to impress me for the past five years is the marked mental improvement so often seen in a patient under the influence of a physical disease with fever, for example, pneumonia or erysipelas.

Patients formerly quite lost and confused, incapable of giving any account of themselves, now become properly adjusted to their surroundings, appreciate reality as if they had always lived in it and can sometimes give a remarkably lucid account of themselves. Not infrequently, especially in recent cases, this improvement continues and increases after convalescence and culminates in the recovery and discharge of the patient. At other times the improvement remains after the illness but does not increase. The patient's mental condition becomes stationary, for example, M. M., aged 34, a female patient here for over five years developed acute mastitis in her right breast about a year ago. For four years previous to this she had been quite rambling and incoherent, untidy, impulsive, destructive, wet and dirty in her habits./

habits. During her illness her habits improved: she was well-behaved, made no attempt to interfere with her dressings and could give quite a good account of her symptoms from day to day. Since her illness she has continued to be clean and tidy, a useful and willing ward worker but simple and facile, of weakened judgment and limited ideation and initiative. Her condition is such, nevertheless, as will warrant her discharge to the care of friends. Favorable results, however, are not the only ones. Unfortunately there is a third possibility which is the more common result in chronic cases. I refer to those cases in which, with the subsidence of fever and the disappearance of convalescence, the patient returns to his or her former state.

Despite the three possible terminations of such an improvement, the fact remains that a physical illness can produce a mental improvement. In other words, in such cases, a physical change has produced a mental change and, in contemplating this, one is forced to ask oneself the following question: Is it possible, since physical change can produce a mental change in the abnormal mind, that physical change originally produced the mental change in the previously normal mind? Has insanity, then, a physical basis?

No one will deny that the mental state in such diseases/

diseases as General Paralysis of the Insane, Pellagra and Huntingdon's Chorea is due to actual cerebral change. Most people will admit that where there is a mental change in the presence of a cerebral tumour, or after a cerebral thrombosis or hemorrhage, or after a brain injury, that the former is probably due to the latter, but the bulk of medical opinion will not go much further than this in assigning mental change to actual cerebral change (excluding, of course, congenital mental defectives).

Now the aim of this thesis is to go further in this direction and to try to demonstrate a physical basis for the various psychosis.

The cure or sound treatment for any disease rests on a thorough understanding of its etiology and pathology. Our only hope of one day finding a cure for mental disorder depends on us first of all getting at the root of the trouble. There has been much conjecture on this subject: various theories have been put forth, but the fact remains that, apart from isolated cases (all with a recognised physical basis) the cause of insanity is not yet known.

Should insanity ultimately be proved to arise from a cerebral change - organic or functional - the effect would be of tremendous importance - not only to the rate-payers generally and contributors to voluntary hospitals, not/

not only to the outlook and social aspect of each particular case, not only to the whole problem of certification, but to the position of Psychiatry itself. Psychiatry, as a physical science, would be indissolubly linked with the other branches of Physics and Medicine. Not only so but, as a physical science, no limits could be set to its possible attainments. A cure for the worst of all human afflictions might one day dawn on the horizon of fruitful research.

For these reasons I have chosen to write a plea for an Objective Psychiatry and will continue my thesis along the following lines:-

- (a) A Critical Survey of the History of Psychiatry.
- (b) The Physiology of Mind.
- (c) The Physiology of some Abnormal States.
- (d) The "Pathology" of the Psychoses:-
 - (1) Melancholia.
 - (2) Mania.
 - (3) Dementia Praecox.
 - (4) Toxic States.
 - (5) Delusional States.
 - (6) Degenerative States.
 - (7) After-effects of Head Injuries.
- (e) Prognosis and Treatment.
- (f) Summary and Conclusions.

A Critical Survey of the History of Psychiatry.

Psychiatry, as a branch of Medicine, should mean the medical treatment of Mental Diseases founded on a scientific knowledge of the nature of these disorders yet, all Psychiatry does consist of, even at the present time, is a wealth of clinical phenomena and description of symptoms beneath which the essential problems of nature and pathogenesis remain unsolved.

Why should Psychiatry lag so far behind the other branches of medicine? Chiefly because its study on anything approaching scientific lines began only towards the end of the eighteenth century and even then it was social rather than medical opinion which was the driving force. Previous to this, save for the Greek and Latin civilisations, the temporary effects of which were quickly forgotten, religious and philosophical prejudices succeeded in making the history of Psychiatry one of profound and prolonged lethargy.

In Mythology insanity was regarded as a frenzy and in the writings of Ancient and Primitive Medicine such frenzies were looked upon as the work of offended spirits of dead men, plants or animals and the prevention or cure of such frenzies lay in the wearing of some talisman/

talisman or fantastic fetish or amulet. The same idea held in the Bible and we read of people being possessed of devils and we have Saul's Melancholia being defined as Demonomania with ecstasy.

To Hippocrates we owe the first attempt at viewing insanity as a bodily illness. He believed that the brain was the organ of the mind and found nothing occult about mental disorders. The tendency to view insanity in some such scientific manner persisted throughout the Graeco-Roman Period (156 B.C. - 576 A.D.) notably in the work of Celsus who regarded mental disorders as due to some disturbance of the liquid, solid or gaseous constituents of the body, and later in the work of Aretaeus to whom we owe the first clear distinction between cerebral and spinal paralysis, and also a very full account of the different kinds of insanities.

Unfortunately with the downfall of the Roman Empire the prevalent degeneration of mind and body led to a return of bigotry, to belief in mysticism and respect for the power of magic. Thus in the Byzantine Period (576 - 732 A.D.) insanity was once more relegated to the spheres of the supernatural for the cure of which we have the usual Byzantine charms and spells.

In the Mohammedan and Jewish Periods (732 - 1096)
we/

we find a general tendency to advancement of science to the extent of founding of hospitals supported by the Caliphs. Bagdad Caliphate was specially noted for founding lunatic asylums. The idea of the Supernatural still held sway, however, though Chemistry was beginning to occupy the field, chiefly at the hands of Geber (702 - 765) discoverer of nitric acid and promoter of water-baths.

During the Medieval Period (1096 - 1438) we find men, for example Roger Bacon, approving of astrology and other modes of superstition on account of their psychotherapeutic effect and even during the Renaissance we find insanity still bound up with superstition and quackery. Though during the later period hygienic conditions generally improved, we find nothing was done to alleviate the condition of the insane who were "chained, beaten, starved and otherwise maltreated and frequently died of cold." It was in this period, in 1547, that the monastery of St. Mary of Bethlehem at London (founded 1246) was converted into a hospital for the insane.

No advancement was made during the seventeenth century except that Paolo Zacchias (1584 - 1659) gave an account of the jurisprudence of insanity and Wilhelm Fabry/

Fabry (1560 - 1624) showed that head injuries may cause insanity. But the conditions under which the insane were housed and kept and the manner in which they were treated still amounted to barbarous ill-usage.

The eighteenth century, from the psychiatric point of view is divided into two periods - early and late. The early part is noteworthy insofar as there arose George Ernest Stahl (1666 - 1734) of Aurbach, Bavaria who taught the doctrine of a "sensitive soul" as the source of all vital phenomena. This Stahlian "animism" was the forerunner of the modern "vital principle" - the "elan vital" of Bergson, - and Stahl's theory of a distraught psyche as a causa causans of mental diseases contained the germ of the present Freudian theory. Stahl, therefore, is a connecting-link between the early eighteenth century and present-day psycho-therapy.

It was in this period also that Pellagra was first described by the Spaniard Casal (1735) but otherwise no advancement in insanity or care for the insane was made. The generally held theory of insanity was still nebulous philosophic speculation. If the insane were dangerous or suicidal, they were housed - which frequently meant/

meant being chained or caged - and if they did not react to opium, camphor, belladonna or "that panacea of psychiatry, tartarus tartarisatus" they were deemed hopeless. If they were harmless they were allowed to run at large - hence the Tom-o-Bedlams of England, and the wizards and warlocks of Scotland.

The close of the eighteenth century presents a very different picture. This period stands high in Medical history as the date of the release of the insane from violent drugging and barbarous ill-treatment and the beginning of their treatment on humane lines.

This was due to Tuke in this country who founded the Quaker Retreat at York in 1794 - the first attempt at humane treatment of the insane - and Pinel (1745 - 1826) ¹⁷⁹³ in France who, at the risk of his own life, struck off chains and abuses of drugging and blood-letting and became the real founder of the modern "open-door" school of psychiatry.

As a consequence of the work of Tuke and Pinel the nineteenth century saw the awakening of a remarkable interest in the clinical study of psychiatry and the proper care of the insane became an object of ambition. There arose many notable psychiatric milestones, that is:- Calmeil, discovered General Paralysis 1826: Pritchard in this/ Bayle in 1822

this country (1835) and Morel in France described Delusional Insanity: We have Esquirol's great work in 1838: Falret in France described Circular Insanity 1853: John Conolly wrote on the Treatment of the Insane without Mechanical Restraint 1856: Kahlbaum described Katatonia: Clouston described Adolescent Insanity and later Emil Kraepelin completed the labours of his predecessors and contemporaries, and built up a system of clinical psychiatry which gives every promise of continuing to endure despite other changes of the future. His "Kompendium" (1883) and thirty lectures in psychiatry (1909) gave birth to a new and simple classification of insanity and introduced the concepts "Dementia Praecox" and "Manic-Depressive Insanity."

During the latter part of the nineteenth century immense advances were also made in the minute anatomy, physiology and pathology of the brain and Griesinger's "Pathology and Therapy of Psychic Disorders" (1845) finally did away with the mysticism of the past and did much to connect clinical picture with pathological anatomy. After Griesinger similar scientific investigations of insanity were made at the hands of Germans, viz:- Meynert in 1884 wrote on Insanity as "Diseases of the Fore-brain" and Wernicke wrote treatises on "Brain Diseases and Insanity". It is worthy of note that the seeking of a physical explanation of mental phenomena, suggested as early as Hippocrates/

Hippocrates but forgotten with the down-fall of Rome, was definitely begun in the latter half of the nineteenth century.

The early twentieth century is characterised by the advent of psycho-pathology. It seems difficult to see why, having been endowed with a systematic clinical classification of mental disorders and the foundation of physical investigations into such disorders, the twentieth century should ignore the latter and go off at a tangent to adopt psycho-pathology, but it is probably due to Charcot's studies in Hysteria followed by Janet's explanation of the varied phenomena of Hysteria in psychological terms. This implied the concept of Dissociation - or "splitting-up" of consciousness and personality. This became the basis of the new psychiatry and culminated in the Freudian theory that functional dissociation, the root of all mental trouble, was caused by the conflict of opposing psychological forces and that resulting symptoms were due to attempts on part of the organism to adapt itself to altered conditions. Upon this Freud proceeded to formulate a number of concepts to explain the nature of the psychological forces, the facts of conscious processes and behaviour resulting from their activities - examples of such concepts are the "unconscious", the "censor", "sexual libido" etc.

In a remarkably short time this Freudian theory has gained/

gained the attention of the world and the approval of many. It is useless to criticise Freud's views, as the critic is rightly met with the answer that these concepts are not facts but merely conceptual formulae offered to explain observed facts just as the law of gravity offers to explain certain physical facts. Also we are told that to properly understand the theory we must adopt it ourselves, as the various facts observed are only understood by the individual psycho-analyst. If we question the validity of Freudian therapy, we are frankly asked - "Have we a better one to offer?" Perhaps not, as our present treatment is still largely empirical and indirect and is not founded on a knowledge of the scientific nature of the disorders. Even so, statistics from Freudian therapy show no better results than those from our own empirical or general measures and the Freudian therapy is admittedly only of use to a limited number and type of cases. Therefore the road to the elucidation of mental disorders and the making of Psychiatry a complete medical science is not the bye-path of the Freudian School. It is the road of diligent and pains-taking scientific investigation at the hands of the anatomists, physiologists and pathologists - the road dreamt of by Hippocrates, discovered by Griesinger, Meynert and Wernicke and worked upon among others, by Maudsley, Mott, recently Pavlow and at present Shaw Bolton.

The Physiology of Mind.

As far back as sixty years ago Maudsley in "Body and Mind" wrote the following:- "It is strangely overlooked by many that the brain is not a dead instrument, but a living organ, with functions of a higher kind than those of any other bodily organ, insomuch as its organic nature and structure far surpass that of any other organ. What, then, are these functions if they are not mental? No one thinks it necessary to assume an immaterial liver behind the hepatic structure in order to account for its functions. But so far as the structure of the nerve and the complex structure of the cerebral convolutions exceed in dignity the hepatic elements and structure, so far must the material functions of the brain exceed those of the liver."

For such opinions as these Maudsley was pilloried as a materialist but now, at last, his opinions are beginning to receive the attention they deserved and his work has been followed up by such men as Howard Warren, Stewart Paton, Dercum, Berry, Maccurdy, Shaw Bolton, Wood Jones and Porteous.

When we say that the brain is a living organ we mean that it is the material and visible symbol of life, that/

that its physiological and psychical functions are manifestations of life, and that its structure is patterned to subserve the performance of these functions.

There are many still who believe that, as the mind is immaterial and the brain material, to attempt to connect them and study them together, leads only to confusion. Why? Could we have a mind without a brain or a human brain without a mind? If the mind is something outside, and independent of, the body why should it always be affected when the brain is affected? Why does a refined man, under the influence of alcohol, become vulgar, lustful and coarse? Why does not the mind, if it be outside the body, use some controlling power over his thought, speech and behaviour? Again, a blow on the head - a physical agent - causes temporary unconsciousness, that is, causes the mind to cease to exist for a time. In the same way an anaesthetic, in temporarily poisoning and paralysing brain cells, at the same time paralyses the mind. As the effect of the anaesthetic wears off, consciousness returns, that is, the mind begins to work again. We notice also that, in the delirium of fever, incoherent rambling takes the place of rational conversation. Would/

Would not the mind prevent this unless, indeed, it also be under the influence of the fever and its toxins? Many similar facts could be mustered to show that there is no separating of the mind and the brain, and that all mental phenomena are in their essence physical, for example, observed facts of the so-called "psycho-physics." Take the "Time-Reaction" experiments. It is significant that any time at all is required for the response to the stimulus but what is much more significant is that this "time" varies according, among other things, to the general condition of the individual - if in good or bad health, if tired, if suffering from any disease, if under the influence of any stimulant or narcotic etc. Clearly these are all physical factors influencing psychical work.

These and other undoubted facts all tend to prove that the brain is the thinking organ - or, in other words, that the brain really has a mind, and the mind really has a brain. It follows from this that, as ideas are evolved in the mind, some change, capable of producing them, must occur in the brain. What, then, is this change, and where, in the brain, does it occur?

The latter part of this question will be answered first. What distinguishes man, with his mind, from the lower/

lower animals without a mind? Surely it is the fact that man can vary his responses, can make use of previous experience, can plan ahead, is aware of choice and volitional action on his own part. In the lower animals responses are fixed and invariable - a certain type of stimulus gives a certain type of response. Anatomically man differs from any of the lower animals in having a larger brain and a much more developed cortex. Is the cortex responsible for this variability of response? Everybody admits the automatic, fixed and invariable character of the spinal reflex. But this fixed response can be extended. It is found also in the brain stem (Palaeo-encephalon) - namely in the medulla, the pons, the crura cerebri, the thalamus and the corpus striatum. Impulses to and from these areas have their "private paths." In effect the brain stem is a segmental apparatus just as much as the spinal cord and is often spoken of as such. To the brain stem we must add the cerebellum whose activities are alike "invariable, innate, structurally predetermined". (Herrick) This leaves us the cerebral cortex or neo-encephalon as the only structure permitting a variable response, and thus it is the cortex which is believed to be directly responsible for that phenomenon which we call mind.

The cerebral cortex has no segmental relationships:
ingress/

ingress and egress is only possible through the primitive segmental brain. Neurones of the end brain are limited to function of intercalary neurones, that is, neurones whose role is to increase the volume and intensity of the transmission and to add to the complexity of the response. It has been calculated that there are over nine thousand, two hundred and eighty million cortical neurones. Each neurone has numerous dendrites, one or two axons and several collaterals, all terminating in numerous tuft-like sub-divisions, each of which communicates by synaptic transmission with similar sub-divisions of other neurones. The arrangement is such that any cortical neurone on one side can be in association, directly or indirectly, with any other cortical neurone on the same or the opposite side. When we consider the number of cortical neurones there are to begin with, and the number of processes each neurone possesses, we realise that the number of possible combinations within the cortex is almost infinite. Hence our variability of response and possibility of adaptation.

The cortex of man is characterized by a marked external portion - the supra-granular layer. We know/

know that at birth this only attains fifty per cent. of its ultimate thickness while the inner, infra-granular layer has already attained seventy-five per cent. The remaining fifty per cent. of the outer layer grows, not by additional cells, but by the myelination of, and multiplication of the processes of the already existing cells, that is, it grows in response to the stimulus of function. Shaw Bolton in "The Brain in Health and Disease" has shown that in aments and dements this supra-granular layer is much diminished in depth and we are forced to the conclusion that this layer is the root of the superiority of the human intelligence over that of any other member of the animal kingdom: and we believe that this outer layer of the cortex is as important for thought processes as the respiratory tract is for the intake of air.

With reference to the actual type of change that takes place in these cells, we have no reason to believe it is other than analogous to that in other parts of the nervous system. That is to say, it is reflex in nature. Also once association has occurred between certain cells, that association will be more readily repeated/

repeated. Neuronic combinations once made are more easily remade.

Dercum, in "The Physiology of Mind" has suggested the theory that cortical cells are capable of amoeboid movement. He bases this on the fact that such movement was once seen by Wierdersheim in the *Leptodora hyalina*, in the oesophagal ganglia of the living animal. He also assumes that any stimulus, reaching a cortical cell, causes the dendrites of the cell to be drawn towards the source of the stimulation, the axon at the same time being drawn towards the succeeding cell, and so the process carries on through succeeding dendrites and axons. A chain of cells thus all move towards the source of stimulation. Though Dercum's theory is as yet unproved, it is interesting and, as we shall see later, can be utilized to explain facts in some abnormal mental states, for example, in Hysteria.

So far, apart from Dercum's theory, we cannot be said to have departed from admitted Physiology, and we are left with little doubt that mental phenomena are really cortical reflexes, and that our highest intellectual work consists of reflexes whose centres are in the supra-granular layer. To quote Berry (*The Modern Psychology*):- "The Central Nervous System is a complex/

complex of neuronie reflex arcs, the chief stations of which are as follows:-

- (1) The simple reflex of reaction to physical stimuli with centres in the spinal cord, for example, knee-jerk.
- (2) The reflexes of the vital functions of life with their centres in the brain stem, for example, breathing.
- (3) The reflexes of the primitive emotions with their centres in the thalamus and corpus striatum, for example, crude, excessive, non-discriminative pain.
- (4) The animal and instructive reflexes of man through the infra-granular layer of the cortex.
- (5) The psychic reflexes of man through the supra-granular layer of the cortex."

And now it remains, only, to indicate in physiological terms what is meant by the various attributes of the mind. As it would take too long to go into every possible attribute, we will confine ourselves to the main ones - viz:- Consciousness, Thought, Attention, Initiative, Memory and Sensation.

What is Consciousness? It is a sense of "awareness" or "aliveness" and it depends on our orientation of ourselves in time and place. In fact, it is the exact opposite of "brown study" or "fit of abstraction" in which/

which all sensory contributions to our "aliveness" are cut off. Consciousness, therefore, is dependent on our senses. Some people say there are two nervous systems:- (1) an outer, the sensitive skin and sense end-organs and (2) an inner, the Central Nervous System whose processes spread out to reach the outer system, and along which all impulses from the outer system pass to their destinations in the various centres. Impulses from the outer system which reach the cortex excite various cells and create a train of cortical activity. Some old combinations may be excited or new ones may be formed. The cortical transmission is the essence of consciousness. No cortex - no consciousness! We know that the sequence of events is (a) sensory impulse, (b) cortical transmission or association, (c) motor discharge. Wood Jones and Porteous in "Matrix of the Mind" have likened the conscious state to a reservoir. The inlet pipes are the sensory channels: the outlet pipes represent motor discharge: the pressure of the accumulated fluid is analogous to the cortical cell excitation which we call consciousness. As the inlet exceeds the outlet, the pressure of the accumulated fluid rises, that is, our conscious state becomes more acute. Thus consciousness consists of:-

- (1) excitation of the senses,
- (2) widely diffused excitation of cortical neurones:
cortical transmission,

- (3) the process is heightened by inadequacy of motor discharge;

and the conscious state of an individual at any given time is the summation of the activities of all the cortical neurones aroused at that time.

What is Thought? Thought is that mental phenomenon which follows automatically on apperception, which in turn is the proper placing of incoming perceptions according as they fit in, wholly or part, with past experience or arouse new combinations. This collocating of the new impression is the function of the common consciousness of the moment, and the very act of collocating it constitutes an act of thought.

What is Attention? A state of Attention is present when the field of consciousness is occupied with one subject, to the exclusion of all other disturbing subjects. It means that the original transmission and associations are continuing undisturbed. This may be explained by saying that the field of activity in the neurones has a high dynamic power. We realise that the dynamic level of the field of consciousness - in other words, its output of energy - depends on (1) the intensity of the metabolic processes, the chemical changes, going on in the substance of the neurones, and (2) upon the number of neurones taking part in it.

Concentration/

Concentration is an exceedingly high dynamic level in the train of transmission with no disturbing ingress, and Will Power is the outcome of this.

Initiative is the resultant of a high dynamic level in the conscious field combined with novel contical(cortical) associations. The power of continually making new associations or combinations differs in individuals. Most people form combinations which resemble those formed by others under similar circumstances. In a few the combinations differ, either slightly or widely, from those formed by the average person. This results in originality, and, if pronounced, in imagination: and, if accompanied by cortical "energy" (high dynamic level in conscious field) we have Initiative.

Memory is due to the capacity of the neurones to appreciate a repetition of certain combinations. The fact that a combination, once formed, is remade more easily is known as Facilitation: the fact that the neurones appreciate and recognise such a re-formation is due to their sentiency and is the physical basis of memory. When the neurones concerned in the conscious state recognise something as having been experienced before, we then have Memory.

Lastly/

Lastly we come to Sensation. Impacts received from the various end-organs are transmitted to the cortex, thence further transmitted and diffused according to combinations and associations, and ultimately "felt" or experienced in every neurone reached by the transmission. The entire cortex "sees," "hears", "smells" etc. wherever it is traversed by the transmission. Cortical "centres" are really avenues of ingress and egress to the general cortex, and their peculiarities of structure are apparently due to their function of reinforcement of the impact.

The Physiology of some Abnormal States

It is not proposed, here, to examine all the phenomena of an abnormal mind. That ground will be covered in the following section dealing with the Psychoses. Here, it is proposed, before going on to the psychoses in detail, to explain away a few terms which will not again come in for an individual explanation, namely, Unconscious, Sleep, Dreams, Hypnosis, Hysteria, Hallucinations, Illusion, and Obsessions.

The unconscious is not really an abnormal state. It implies those cortical neurones which are not, at the moment, active but which will, on being stimulated, become active and evolve new thoughts or revive old memories. Thus, at any moment the quiescent neurones constitute the unconscious field, and the active neurones constitute the conscious field. What is active one moment becomes quiescent the next, so that the conscious and unconscious fields are continually changing; and the neurones of the latter, though, quiescent, retain their potential, so that on stimulation, previous combinations are automatically produced.

Sleep is the exact opposite of the waking, conscious state in which a train of cortical activity is continuous. If we produce cessation of function throughout the cortical neurones, we produce sleep.

How/

How is this brought about? It may be explained by either of two means. Firstly the neurones themselves may become poisoned by fatigue products, or toxic substances in the blood, and rendered incapable of producing energy to transmit any impulse, thus the train of transmission ceases. Secondly, neurones exhausted by fatigue or otherwise, diminish in cell contents and in volume and their processes become retracted. By retraction of their processes the cells are no longer in relation with each other. Now it is evident that active neurones are in some sort of contact. It is equally evident that quiescent neurones, to retain their potential, must be, if not in contact, very nearly so. These neurones which, by retraction of their processes, become isolated from each other must be without function, and cessation of function in neurones produces sleep.

Sound sleep is dreamless sleep, but when Dreams do arise, they constitute a "train of transmission." This train of transmission may have its origin in either of three ways. (We know that impacts from the external world, through the neo-encephalon are cut off as the cortex is "asleep.") First, transmission may arise from impacts received from the viscera or from the soma generally. Secondly, transmission may be started by direct stimulation of the neurones by substances circulating in the blood, for example, toxins, fatigue products, hormones in unusual amounts. Thirdly, dreams/

dreams may be explained on the basis of a neural overflow of after-excitation of the cells of the brain. This neural overflow is the residue of neural energy not expended in the day's activities. This sometimes accumulates in sleep and finds an outlet in sub-vocalized thought accompanied by the appropriate imagery. The train of transmission, no matter how arising, naturally discharges itself along the more commonly facilitated paths. Former neurone combinations are reformed; many are compounded and unusual, so that bizarre combinations result. It is worthy of note that the neural excitement is sometimes strong enough to discharge itself in overt action such as somnambulistic walking or talking.

Hysteria and Hypnotism can be examined together as hypnotism is nothing more than artificially produced hysteria. It is undeniable that the symptoms in each case are cortical in origin and are the result of suggestion. In hypnosis a state of partial sleep is induced in which impacts from the various sensory receptions are all inhibited, except those from the sense of hearing. Thus a spoken suggestion from the operator sets in motion a train of neurone activity which is allowed to proceed unchecked and uncorrected by impressions from any other sense. No wonder, then, that the patient proves susceptible and the suggestion succeeds!/
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succeeds! In hysteria, though the patient is not asleep, we have exactly the same thing in so far as he is abnormally susceptible to suggestion. But in hysteria the suggestion does not always come from the outside: it may arise within the patient, for example, suggestion of anaesthesia arising during medical examination. The hysterical patient accepts suggestions both direct and indirect. The aetiology of the suggestibility in hypnosis and hysteria is also different. In the former it is artificially produced: in the latter it is the product of an inherited degeneracy.

An Hallucination is a perception occurring in the absence of any sensation and is due to the stimulation or irritation of the special cortical 'centre' of the involved sense. The irritation is usually the direct action of a circulating toxin but sometimes it is pressure or organic disease. The auditory and visual centres are those usually involved and these neurones, irritated into activity, naturally link themselves with the main train of neurone activity, that is, the common consciousness of the moment and are naturally regarded by the latter as coming from without. Thus the words heard, or objects seen, are referred to the outside world.

An/

An Illusion is a false perception and is due to a faulty combination of the cortical neurones aroused by the impacts received, or an imperfect correlation of the neurones with combinations previously formed. The result is mistakes of recognition occur and, if pronounced, a state of confusion arises.

Obsessive acts are determined by impulses which are not voluntary, and obsessive thoughts and feelings are those which, though foreign to healthy experience, arise and persist in the mind in spite of conscious effort to banish them. How do we explain the appearance of these actions, thoughts and feelings? We know that every integration controls its subsidiary parts and, should a unitary integration suffer disintegration, some or all of its component parts may separately appear as such. Now cortical equilibrium is a perfect integration. What constitutes cortical integration we do not, as yet, know. It may be the opposing effects of inhibitory and excitatory forces; it may be something which the future will discover. What we do know is that cortical integration can suffer damage and, when it does, consciousness and personality are no longer so perfectly attuned that all behaviour can be explained in terms of rational desires. Now we have isolated thoughts, feelings and/

and impulses, dissociated from the conscious self, and intruding upon it as if from the outside. Hence our obsessions!

To correlate the outstanding symptoms in the various mental disorders with pathological physiology in the cortex. The various psychoses will be discussed separately in the following order:-

- (1) Melancholia
- (2) Mania
- (3) Dementia Praecox
- (4) Toxic States
- (5) Delusional States
- (6) Degenerative States
- (7) After-effects of Head Injuries.

Melancholia is characterized by: (1) Persistent and Profound Depression or mental suffering, (2) Retarded cerebration, (3) Failure of Occupation. It is noticed in every case of Melancholia that all the bodily functions (digestion, excretion, bodily movements, etc.) are being performed inadequately. It follows from this that the central nervous system - the control of all bodily function - is working at a low level, and the fact that there is a "bodily" depression and a "mental" depression present at one and the same time, tends to prove that there is a generalized retardation of function or inhibition present throughout the Central Nervous System. - 30 - This inhibition is generalized it must be caused by something in the circulation. This "something" may be a toxic hormone or may

The "Pathology" of the Psychoses

In this section an attempt will be made briefly to correlate the outstanding symptoms in the various mental disorders with pathological physiology in the cortex. The various psychoses will be discussed separately in the following order:-

- (1) Melancholia
- (2) Mania
- (3) Dementia Praecox
- (4) Toxic States
- (5) Delusional States
- (6) Degenerative States
- (7) After-effects of Head Injuries.

Melancholia is characterised by: (1) Persistent and Profound Depression or mental suffering, (2) Retarded cerebation, (3) Failure of Occupation. It is noticed in every case of Melancholia that all the bodily functions (digestion, excretion, bodily movements, etc.) are being performed inadequately. It follows from this that the central nervous system - the control of all bodily function - is working at a low level, and, the fact that there is a "bodily" depression and a "mental" depression present at one and the same time, tends to prove that there is a generalised retardation of function or inhibition present throughout the Central Nervous System. As this inhibition is generalised it must be caused by something in the circulation. This "something" may be a toxic hormone or may

be excessive fatigue products, or may arise from a septic focus anywhere in the body. It will have to be sought for in each individual case. What interests us here is its mode of action. It causes retarded cerebration by having a depressing action on the function of the cortical synapses so that transmission becomes slow and difficult. This retardation of mental processes in itself causes mental pain or suffering, and, in addition to this, remembering that neurones possess sentiency, we realise that the action of the toxin on the neurone itself may arouse pain. The pain though real and profound is yet without obvious cause or reason. Hence the melancholic's retarded cerebration, mental suffering, and unreasonable depression. His failure of occupation is the natural outcome of his mental state and any delusion he may evince is the natural outcome of trying to find a reason for his depression.

Mania: is the direct opposite of Melancholia, both in symptomatology and cortical pathology. Its symptoms are: (1) Persistent Elation, (2) Facility of Thought - Free Flow of Ideas, and (3) Pressure of Occupation. All the bodily functions are working at high speed and there is a generalised heightening of function in the Central Nervous System. Thus in Mania there is a toxin/

toxin or toxic hormone in the circulation which causes a diminution in the resistance of the synapses. There is a general release of inhibition and the neurones evolve and discharge energy with unusual ease, and this energy flows with lessened resistance along the cell processes. Thus transmission and association are facilitated. Ideas rush through the mind; everything is easy; the patient is expansive, boisterous, boastful and must be "up and doing." It is noticed that there is often a coarseness about a maniac's talk and behaviour. The explanation is this. Firstly, normal acts require time for detail; the maniac is too full of ideas to spend time on any one; secondly, in Mania the cortical discharge diffuses "en masse" and along the larger paths in which is least resistance but which lead to the coarser ideas and acts; thirdly, fatigue early impairs the synapses on which finer adjustments depend. Therefore, as a case progresses, coarse and glaring association alone are present.

(3) Dementia Praecox. Grouping all varieties of this entity under the one heading "Dementia Praecox" one may say the chief symptoms are:-

- (1) A Peculiar Weakening of the mind, affecting first the feelings and will, and later the intellect - producing apathy, emotional indifference, torpidity.

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- (2) Loss of the inner unity of the mind, splitting of the personality and appearance of automatic behaviour: that is, Fixed Attitudes, Stereotypy, Verbigeration, Mutism, Impulsive Outbursts, etc.
- (3) Bizarre ideas and behaviour.

Dementia Praecox is known to be the result of a degenerate heredity and an inherited degeneracy. The patient is born with a lack of vitality in his cortical neurones (and basal ganglia) and in the cells of his endocrine organs. As a result, by the time he reaches adolescence his cortical cells are beginning to give out and his gonads and other endocrine organs are showing arrest of function and fibrosis. The cortex, which is what chiefly interests us, shows the following:-

- (1) Excess of lipoid granules in the cells.
- (2) Swelling and vacuolation of the cells.
- (3) Loss of Nissl granules.
- (4) Sometimes loss of dendritic processes.
- (5) Diminution in the oxidation processes in the cortex.
- (6) Increase in neutral sulphur content in whole brain.

These changes are indicative of hypofunction and, in some cases, suppression of function, in the cortical neurones. The nerve substance is defective and the field of cortical activity (that is, consciousness) has/

has a very low dynamic level. Hence, instead of attention and interest (which we have seen requires a high dynamic level in cortical field of activity) we find, on the part of the patient, apathy, indifference, vacant aimlessness. The lowered intensity of the metabolic processes results in slowness of speech, poverty of ideation, stereotypy, tendency to fixed positions, verbigeration and even stupor. In addition, there is another factor in Dementia Praecox. The sex glands are admittedly dys-functioning, so it is probable they are sending a toxic hormone into the circulation. This hormone is liable to irritate any group of cortical cells. Now normally a train of transmission diffuses from active into inactive cells. In Dementia Praecox, the cortex as a whole being **adynamic**, the active field (that is, consciousness) is diminished in intensity. Therefore should any outside group of cells become suddenly spontaneously active from stimulation by a toxin it is possible that the direction of cortical activity may be reversed, and these new activities (that is, outside group of cells) flow into the less resistant (conscious) field. This accounts for the Dementia Praecox's bizarre, impulsive behaviour and ideas and, though they may happen to represent things 'desired' or 'feared' it is not essential that they should/

should, and even when they do, it is unnecessary thereby to assume they represent "complexes" which have been 'repressed.'

Toxic States: The outstanding symptoms of the various disorders included under the heading "Toxic Psychoses" are:

- (1) Mental confusion with dis-orientation: sometimes delirium: sometimes stupor.
- (2) Vivid Hallucinations and Illusions.

The emotions vary from case to case and the body illness, always pronounced, depends on the etiological factor. What we want to discover is how the delirium, confusion or stupor, hallucinations and illusions arise. These psychoses, we know, are the result of infection, intoxication and exhaustion, and the mental symptoms are due to the action of toxins or poisons primarily on the synapses of cortical neurones, and secondarily on the bodies of the neurones. The Physiology of hallucinations and illusions has already been explained. It remains only to explain the confusion and delirium. The synapses are irritated by the poisons and synaptic relations become continuously and irregularly made and broken. The result is that neuronc discharges are irregular and there arises a state of ever-changing and varying combinations and associations along the neurones. When this is rapid and pronounced we have delirium - when slower

we have confusion: and when synapses and neurones are poisoned to the extent of having all activity almost abolished, we have stupor. It is easy to understand why, in all confused and delirious states, the symptoms are continually changing, and show no tendency to become fixed.

Delusional States. Here we are not concerned with the Melancholic's ideas of unworthiness, or the Dementia Praecox's bizarre delusions, or the fleeting, changing delusions of a case of toxic insanity. We are concerned only with those disorders in which the gradual and insidious development of fixed, logical and systematised delusions, with or without the presence of hallucination, is the fundamental symptom. These delusions are fixed, permanent, impervious to argument and conflicting evidence, and built upon a perfectly logical arrangement of ideas. That is to say, granted the patient's first premises in his scheme of ideas were correct, the rest would follow. Now the patient's beliefs are as real, or even more real, to him than the outside, concrete world. Normally our beliefs, for example, on religion, on morality, are not as real and definite as the concrete world, but, if we suddenly developed a raised temperature, feeling of malaise, and a stabbing pain in the side of the chest, made worse by respiration/

respiration, the conviction we were suffering from pleurisy would be as real as anything else. Our case in this latter case the connection between our belief and our bodily state would be obvious but, though the connection is not obvious in the psychotic, the assumption is, that his delusions are the outward and visible sign of an organic or bodily necessity. This organic necessity may not be, and usually is not, discoverable by ordinary medical examination, but we have only to think of the years of hypochondria, experienced by most patients before the final outbreak of delusions, to realise that all is not well within the organism. But, once again, it is not the etiology, but the state of physiology within the cortex that interests us here. In these cases of fixed delusions we are dealing with relations between neurones which recur with such ease and constancy as to be potentially fixed in character. There is no irritation or depression of synapses or abnormal metabolism or discharge in part of the neurone. Everything in the cortex is as usual, apart from the fact that certain neurones have become linked together in such a way that, should any one be stimulated, the whole group in its original formation is automatically stimulated. Thus it is readily understood that such delusions should be inaccessible to any conflicting train of argument, for any impulse approaching the neurones/

neurones concerned merely results in the re-formation of the old combination. Hence a delusion, once fixed, becomes permanent.

Degenerative States: It is the natural end of all men, at the hands of old age, that they should gradually reach the stage of degeneration and decay. Sometimes the process is more active in one organ than another. When degeneration of the brain outruns that of the body, Dementia is the result. The brain has been likened to a slate on which inheritance, education, environment, etc. all write. Slates, we know, differ in quality. Some make excellent writing materials, others make indifferent writing material. But even the best slate after many years of use begins to fail so that what is now written on it is not so clear. Ultimately it has to be discarded as it is almost impossible to make any effect on it. This simile, though not perfect, helps to explain how the senile brain produces a mind little influenced by its surroundings, with no memory for recent events, poverty of ideation, and tendency to live in the past - in fact, 'dotage and anecdotage.' The cortical neurones are no longer capable of receiving and retaining new impressions but past impressions remain. Therefore recent happenings are forgotten but the happenings of years ago are remembered. As cell bodies and/

and processes can now only work feebly, transmission is slow, neuronie discharge is slight, paths of association are no longer definite and the dynamic level of the cortical field is greatly reduced. Thus the patient may be apathetic, mildly confused, somnolent and merely vegetative. On the other hand decaying, dying cells may be a source of irritation to other cells around them and lead to a state of restlessness, over-activity, greater confusion, even hallucinations, or, by interfering with paths of association and cell group-formations, lead to fleeting unsystematised delusions.

Though cortical degeneration would be the natural outcome of excessive longevity, in actual practice it is much more frequently seen as an "unnatural outcome" in patients whose ages rank from the thirties to the sixties. By "unnatural outcome" we mean the result of some disease, poison or toxin. Examples of such degeneration are:

- (1) Arterio-pathic Dementia: arises between 50-60 years.

Cortical degeneration here is due to sclerosis of the cerebral arteries producing a deficient blood-supply to the neurones.

- (2) General Paralysis of the Insane: This really can arise at any age if we include congenital cases, but acquired cases usually arise between 30-40 years. It is due/

due to the toxin of the spirochaeta of syphilis and produces cortical degeneration by:

- (a) irritating cerebral vessels, producing thickened walls, new capillaries. This in turn produces:-
 - (b) Engorged lymph spaces which irritate neuroglial cells and
 - (c) produce enormous increase of neuroglial cells and process which
 - (d) strangle the processes of the cortical cells and produce secondary degeneration of the cells.
- (3) Pellagra arising in adults. Toxin produces in the cortex a slow degeneration of the neurone. Neurones are swollen, pale, homogenous, misshapen, with loss of Nissl granules and enlarged eccentric nucleus. (personal case)
- (4) Huntingdon's Chorea: in adults over 30 years.

Here though the lesion primarily affects the basal ganglion and mid-brain, the cortex is ultimately affected and pronounced neuronc degeneration results. Neurones are sparse in number, disintegrated, degenerated, with marked excess of pigment. (personal case).

These examples will suffice to show that, though the detailed histology and detailed symptomatology may differ from case to case, all degenerative states, are alike insofar as the cerebral organisation, in suffering from a gradual degeneration and decay, has the outward and visible sign of a gradual weakening of the mind, ending in Dementia.

After-Effects of Head Injuries. It is always interesting to wonder why some injuries to the brain leave an after train of mental defect, while others do not; and, in seeking an explanation of this, one alights upon an aspect of the cortical cells on which we have not, so far, touched. That aspect is this - that the function of the cellular units is relational, not mechanical. The function of the Central Nervous System is really the product of relationship of points of excitation rather than the excitation of specific points. To make this clear, let us recall that any three points if joined together in certain relationship will make a triangle. We need only think of three points to get an image of a triangle. To add any more points to one of the sides will only intensify it. Similarly any specific perception lies in the relationship of the cells stimulated. So long as that relationship is expressed, we get our perception. To add more cells will only give us more detail. Thus we can understand that if many elements contribute to a design the absence of a few of them need not abolish the design. These injuries to the brain, unless extensive, may produce no loss of function.

It is not intended that the above section should be regarded as exhaustive. It is merely intended as an indication/

indication of the way in which abnormal mental symptoms are produced. That trauma, poison, infections and products of exhaustion from violent emotion can produce insanity is known by the man in the street, as well as by the psychiatrist. What is not known, even by the psychiatrist, is the manner in which these causes operate on the cerebral organization. Shaw Bolton is the great pioneer of the work of enquiry into these pathological processes taking place in the brain but much research in this sphere has still to be done.

Prognosis and treatment.

We are constantly told that it is the scarcity of our knowledge of nervous structure and function that necessitates a psychological, or rather psycho-pathological, interpretation of morbid mental phenomena. This is our great stimulus to the investigation of the physical basis of mental disorders. It is a stimulus which was active in the latter part of the nineteenth century, became dormant during the early part of the twentieth century, and now has re-awakened to a fresh outburst of activity. Should the results of this present activity prove as fruitful in discoveries of structure and function as did the nineteenth century, then before long the day will dawn when that artificial barrier between physiological processes and psychical processes will be swept aside, and Psychiatry will take its rightful place as a twin-study to neurology - both the offspring of the science of medicine.

How are we to reach this goal? Not by adopting vague conceptual theories for a limited number of individual symptoms - such as the Freudian system invites us to do. Such concepts represent nothing that is actually seen to occur in the world. To quote Dercum: "they are merely artificial pegs in which we hang the logic of our ideas." Whether or not we accept Bergson's view, - that life is a cosmic force evolving through organic matter and an ascending series of nervous systems and/

and seeking that form of freedom which it has ultimately attained in the brain of man - we know that the more intricate a brain is, the more complex are the psychical functions: and we also know that there is no essential difference of kind, but only of degree, between the reflexes of the amoeba and the highest psychical reflexes of man.

Coming back to mental disorders, we realise that there is no symptom shown in these morbid states which is not present in the normal state. We all have our little delusions, our distorted ways of looking at things, our obsessions, our moods, our apathies, our dreams. The keynote to the normal state is that no one symptom is allowed to monopolise the field to the extent of producing irrational conduct. The cortex maintains its normal equilibrium and is a complete, smoothly-working integration. In the abnormal states this equilibrium is lost: we have disintegration, or dissociation.

This, then, is the problem of the immediate future. - What constitutes cortical equilibrium? This is a definite concrete problem concerning a definite concrete brain, and will only be solved by diligent research in the form of observation and analysis of scientific facts concerning that brain. Once the source of this equilibrium has been discovered and its lines of working laid bare, treatment, in the form of artificial methods of approaching and affecting it, will automatically follow. We have referred previously to the/

the beneficial effects noted in patients after a physical illness with pyrexia. We all know the good results derived from giving Malaria and other fevers, and Tryparsamide in General Paralysis and Post-Encephalitic states. These things help to restore cortical equilibrium but, so far, we do not know how or why. All this, and more, we will know in the days to come.

In the meantime, if insanity is to be given the benefit of complete scientific investigation, its study and treatment must be dissociated as far as possible from its legal aspect. Even at the present time the general public are too apt to assume that the only sufferers from mental disorders are the inhabitants of our mental hospitals, and that these cases constitute something apart from the ordinary citizen, unfortunate but un-interesting, doomed to seclusion and of little civic value. Even if the average medical man does not share this opinion, the medical profession, as a whole, has a sufficient antipathy to the Law and its administration to seek to avoid all connection with either wherever possible. The Law does its best for the public at large: the medical man does his best for each private individual patient. Naturally these two viewpoints frequently clash and in no sphere more so than that of the mentally disordered. Though certification will always be necessary for some acute cases, and for all prolonged and hopeless cases, it must be made possible for the average case of early mental disorder, quite apart from financial/

financial considerations, to enter and leave an ordinary hospital as he or she desires. Just as a gynaecological case on entering a general hospital is sent to the Gynaecological Department, so a mental case should be sent to the Mental Department, and ingress and egress should be equally voluntary in both cases. Especially should this be possible in all large cities and teaching centres.

Such a movement is already on foot in some places but it must become general. Relatives, then, will no longer fear the Law and the terror of certification, and seek to hide, as long as possible, the abnormalities in members of their households rather than have them "mix with lunatics." Patients themselves, when taught to regard their ailment as a medical illness, capable of medical treatment, will freely and early seek advice. There will no longer be anything to hide through fear of being looked upon as un-natural, or being deprived of one's liberty. Last, but far from least, the difference from the medical point of view will be enormous. Cases will be tackled earlier - when they are eager, willing and able to co-operate with the physician. Physicians will approach their cases in a scientific spirit, unhampered by prejudice and petty restriction, linking forces with the anatomist, physiologist and neuropathologist, and aided by well-equipped laboratories and skilled assistants. In this way, Psychiatry will become the Science of Cerebral Organisation, founded on cold, un-emotional facts - and no one can put a limit to its possible scope.

Summary and Conclusions.

The aim of the foregoing sections has been to show that there is no essential difference between the phenomena of mind and all other bodily phenomena, and hence the examination of all morbid mental phenomena must be from the standpoint of scientific observation and analysis.

Reviewing the history of Psychiatry we find that, except at the hands of Hippocrates who regarded the brain as the organ of the mind and found nothing occult about mental disorders, insanity, from the days of Primitive medicine until the end of the eighteenth century, was regarded as a frenzy, a demoniacal possession or other work of supernatural powers and was hedged around with superstition and quackery, the only treatment the insane received amounting to barbarous ill-usage. Towards the end of the eighteenth century, Tuke in this country, and Pinel^e in France, were responsible for a movement which freed the insane from their violent ill-usage and set on foot their treatment along humane lines. As a result of this a remarkable interest continued during the nineteenth century in the clinical study of Psychiatry, and produced brilliant clinical descriptive work from Pritchard, Morel, Esquirol, Falret, Connolly, Kahlbaum and Clouston/

Clouston and culminated in Kraepelin's system of Clinical Psychiatry, which is still the accepted system. These men classified mental disorders according to their clinical symptoms but a few others, notably Griesinger, Meynert and Wernicke, towards the end of the same century sought to find a physical explanation of these symptoms in the anatomy, physiology and pathology of the brain and became the original pioneers of an Objective Psychiatry. Instead of their work being followed up by others in the early part of this century, the theory of Psychopathology and its study arose at the hands of Charcot, followed by Janet and elaborated by Freud. As Psychopathology, at its, best, seeks only to explain a limited number of mental symptoms, it is now realised that it can never hope to cover Psychiatry and we are once more seeking the physical explanation of psychical facts.

Can we dissociate the mind from the body? Can we have a mind without a brain and a brain without a body? This seems hardly likely when we recall the effects of drugs such as alcohol, anaesthetics, trauma to the head, and the toxins of fevers. These agents, in producing a physiological effects on the brain, produce a very definite psychical change and we are driven to the conclusion that the brain, or some part of it, is the thinking organ. Psychically man differs from/

from the lower animals in possessing consciousness, in showing a variability of response and volitional behaviour. Anatomically he differs in having a larger brain and a much more developed cortex. Spinal reflexes are fixed. Responses from the brain stem, that is medulla, pons, crura cerebri, the thalamus and corpus striatum are equally fixed and invariable. So also are the responses of the cerebellum. That leaves the cortex as the only structure permitting a variable response and thus the cortex is believed to be directly responsible for that phenomenon which we call mind. It is possible for any cortical neurone on one side to communicate with any other cortical neurone on the same or opposite side, and, as there are almost ten thousand million cortical neurones, the number of possible associations is almost infinite. This is the basis of our variability of response, our possibility of adaptation and power of learning by experience. Shaw Bolton has shown that in aments and dements it is the supragranular layer of the cortex which is chiefly affected, so that this layer is regarded as the seat of our highest intellectual abilities.

To substantiate the conclusion that the brain is the organ of the mind, both normal and abnormal mental phenomena are defined in terms of cortical Physiology.

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A few examples are:-

Consciousness is due to a widely diffused excitation of cortical neurones dependent upon excitation of the senses; and the conscious state of an individual at any given moment is the summation of the activities of all the cortical neurones aroused at that moment.

Thought is a function of the common consciousness of the moment - this function being that of collocating a new, incoming impression according as it fits in with former cortical associations, or requires the formation of new cortical associations.

Attention is the state of having the field of consciousness occupied with one subject to the exclusion of other subjects. It means that the original cortical transmission continues undisturbed and is due to the field of activity in the neurones having a high dynamic power. Dynamic power, or, output of energy, depends on (1) the intensity of the metabolic processes in the neurones, and (2) the number of neurones taking part in the activity.

The Unconscious implies those cortical neurones which are not, at the moment, active but which will, on being stimulated, become active and evolve new thoughts or/



or revive old memories. Thus the "Unconscious" of one minute becomes the "Conscious" of the next, and vice versa.

An Hallucination, or perception occurring in the absence of sensation, is due to the stimulation or irritation, by toxin circulating in the blood or pressure from organic disease, of the special cortical "centre" of the involved sense. The neurones thus irritated into activity link themselves with the main train of cortical activity, which is constituting the conscious state, and are naturally regarded by the latter as coming from without. Thus the "sound heard" or "object seen" are referred to the outside world.

Delusions arise when certain neurones become linked together in such a way that, should any one be stimulated, the whole group in its original formation is automatically stimulated. Inaccessibility to conflicting arguments is readily understood, for any impulse approaching the neurones merely results in the re-formation of the old combination.

Confusion and Delirium is due to cortical synapses being irritated by toxins, so that synaptic relations between neurones become continuously and irregularly made and broken. The result is that the patient has a myriorama of/
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of ever changing and varying combinations and associations among the neurones.

Stupor results when synapses are poisoned to such an extent that their activity is almost abolished.

Melancholia is due to the action of a depressant on the function of the cortical synapses, so that transmission becomes slow and difficult. This in itself causes mental pain, but, in so far as neurones possess sentience, the depressing toxin may also directly cause pain by its direct action on the body of the cell.

Mania is due to the action of a toxin or toxic hormone which produces diminution in the resistance of cortical synapses, so that there is a general release of inhibition, neurones freely evolve and discharge energy, all discharge flows easily and rapidly along cells processes and everything is heightened up.

Apathy and Lethargy are due to a lowering of the dynamic level in the field of cortical activity, due in turn to a lowered intensity of the metabolic processes within the cells and a nerve substance which is inherently defective - both conditions being present in Dementia Praecox. In the same disorder, the adynamia of the conscious field results in stereotypy, perseveration, verbigation/

verbigation and automatic behaviour generally. The train of cortical transmission is reduced to a shallow, narrow, slow stream which may, for a while, almost cease altogether.

Dementia is the obvious result of gross destruction, degeneration, decay or death of the cortical neurones.

If we think at all about insanity we realise that there is no symptom present in mental disorder which is not present in the normal state. We all have our pet delusions, our impulses, our apathies, our moods etc., but, in the normal state, no one symptom is allowed to dominate to the extent of producing irrational behaviour. The cortex is a smoothly working equilibrium, everything is "in gear", so that no one factor is allowed to produce a discordant note. In mental disorder, this equilibrium is lost. The problem for immediate research, therefore, is:- What constitutes cortical equilibrium?

This is a scientific problem concerning a definite concrete brain and must be tackled in a scientific manner. To make this possible, insanity must be dissociated, as far as possible, from its legal aspect. It must be possible for patients to voluntarily seek advice, and enter or leave ordinary hospitals, like ordinary patients, at their own expressed wish. Physicians, unhampered by legal/

legal restrictions and prejudice, must approach early cases in a scientific spirit. That is to say, they must have the advantages of a general hospital atmosphere, with well equipped laboratories and skilled assistants. They must co-operate with the anatomist, physiologist and neuro-pathologist. If this is systematically put into force, the basis of cortical equilibrium will, before long, be no longer an unsolved problem.

The above paragraphs constitute a recapitulation of the main body of this thesis. Conclusions arrived at, in this work, may be enumerated as follows:-

(1) The brain is the thinking organ and is the concrete symbol of that phenomenon which we call mind.

(2) There is no essential difference between the spinal reflexes and our most complex intellectual functions. Those latter constitute reflexes in the supra-granular layer of the cortex.

(3) There is no symptom, present in mental disorder, which is not found in the normal states. The difference between the two conditions is that cortical equilibrium is lost in the morbid state.

(4)/

(4) The basis of cortical equilibrium is a scientific problem demanding immediate investigation.

(5) This problem will only be solved by dissociating insanity as far as possible from its legal aspect, allowing average cases to be admitted, like ordinary patients, into ordinary hospitals, and their investigation to be carried out by the psychiatrist in collaboration with the anatomist, physiologist and neuropathologist. *but not the psychologist or psychopathologist!*

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